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W. B. Niles
Iowa State College

HOG CHOLERA AND SWINE PLAGUE.

BY W. B. NILES.

The subject of hog cholera is such an important one to the people of Iowa that a brief article in these pages setting forth some of the main facts that have been observed in our work here, and elsewhere by others, seems warranted. While we have nothing to offer in the way of a specific cure and cannot point out the way by which the disease can be easily eradicated, a careful study of the facts herein set forth will enable the painstaking swine owner to more successfully deal with the two prevalent epizootic diseases of swine—hog cholera and swine plague.

The above named diseases are often described under the name of hog cholera, but it is now recognized by scientists that two diseases exist, due to different germs (bacteria) and presenting somewhat different symptoms. Both are wide spread and may exist in the same herd, also in the same animal, at the same time. As it requires a very careful study of an outbreak of swine disease—the after-death examination of several that have died or been killed for the purpose and a bacteriological study of the blood and organs—before it can be determined whether but one or both diseases are present, it has not been definitely learned which disease is most prevalent. Our experience in this state goes to show that here, at least, the two diseases are often associated and that uncomplicated swine plague is seldom met with. The experience of the writer in another state (S. C.) points to the same conclusion. Hog cholera is probably the most prevalent and the cause of the greatest loss.

Both diseases are due to a specific virus and communicable from one animal to another. The germ of hog cholera differs from that of swine plague by being slightly larger, having power of movement in liquids, and by developing outside the body when conditions are favorable. The virus of both diseases enters the body of the hog with food and drink, or in the inspired air.

When the disease, usually known as cholera, first appeared among Iowa hogs, is not definitely known. The probabilities are that the disease was originally imported from England and appeared in Iowa and the adjoining states in the late fifties. From this time on, outbreaks became more frequent, until in 1878, when the Commissioner of Agriculture appointed ten investigators to study the disease in those sections of the country where it most extensively prevailed, one was assigned to Iowa. Since that time the disease has more or less extensively prevailed every year. In 1886 the state veterinarian stated in his report that "hog cholera probably occasions more loss directly to the stock growing interests of the state than all other diseases combined."

The affection varies greatly in the extent of its ravages from year to year. In some seasons the number of outbreaks is comparatively small, while in others the loss is very great. In the past two or three years the disease has prevailed as an epizootic over a greater portion of the state. Director Sage of the Weather and Crop Service shows in his recent report that for the past season the loss has been twenty per cent. of the entire number of hogs in the state.

The symptoms of both hog cholera and swine plague have been so often described that a detailed description of them is not necessary here. In the main, the symptoms of the two affections are much alike and cannot be differentiated by the casual observer.

Partial or complete loss of appetite, a tendency to lie about in bunches in the nest, more or less coughing, and a purple color of the skin most marked along the abdomen and inside the thighs are among the most prominent indications of

disease noticed. In some outbreaks diarrhœa will be an early and constant symptom, while in others the reverse will be the rule. Again the disease may for some time attack only young pigs, assuming such a mild course that the true nature of the affection will not be suspected. In different outbreaks the symptoms vary so much that the most experienced may not be able to diagnose the trouble without making an after-death examination of one that has died. I wish to call especial attention to this fact, *that one herd of hogs suffering from cholera may present entirely different symptoms from another herd having the same disease.* For example: During the past summer a well qualified veterinary surgeon wrote me regarding a swine disease raging in his neighborhood which he did not diagnose as cholera, but which from his description I am satisfied was genuine cholera. Correspondence with a Nebraska farmer who had written to an agricultural paper and had been informed in reply that his swine had indigestion or some other complaint due to improper feeding, revealed that his herd also had genuine hog cholera; for when instructed what to look for after death the characteristic changes of cholera were observed. Much has been written about "so-called cholera," and the statement is often made that "in the fall and early winter all diseases of hogs are reported as cholera." Other diseases of swine are no doubt occasionally reported as cholera, but it is my belief that such a mistake is not often made, and I wish to state emphatically that when a large per cent of a herd of swine die and apparently the same disease occurs on neighboring farms, the disease is either hog cholera or swine plague. A few other diseases may cause considerable loss in a herd, especially of young pigs, but I have yet to find an instance where a majority of even a single herd have died from another cause, and any one having disease in his herd, involving a considerable per cent, should be suspicious of one or the other of the above mentioned diseases.

While the symptoms may be obscure and the first attacked in the herd linger so long with a mild attack as to throw the owner off his guard, an after-death examination,

especially on an animal that has been sick for some time, will reveal the presence of one or the other of the diseases under discussion. Hog cholera being principally a disease of the intestinal tract, the greatest changes are looked for there. The most characteristic occurs in the first part of the large intestine. Small circular patches, slightly elevated above the surrounding membrane and varying in size from a pin head to a quarter dollar, usually dark in color (sometimes of yellow cast), are found on the inner wall near where the small gut enters. These ulcers, as they are termed by Dr. Salmon, of the Bureau of Animal Industry, are found best developed in an animal that has been sick for several days. When the patient dies suddenly they will not be observed.

In swine plague the chest cavity is the principal seat of the disease and the lungs will be found inflamed and more or less adherent to the chest wall. Large portions of lung tissue are often completely hepatized (solidified) and frequently the chest cavity contains a considerable quantity of serum. As before stated both diseases may exist in the same animal, and then the intestinal and lung changes may be seen in the same subject.

A more practical question and one much discussed at the present time is: "How are these diseases originated and how communicated from place to place?" For a proper understanding of these questions it is necessary to remember that both affections are communicable and due to a specific germ without which the disease will not exist. Being due to a specific virus, spontaneous origin is impossible, just as is the case of glanders in the horse or smallpox in man. No system of feeding or exposure to bad sanitary conditions or any other sort of treatment will originate, without the presence of the specific germ, any communicable disease of man or beast.

Remembering that the presence of the virus is essential to the production of an outbreak of cholera, it will be readily understood that the diseased animal is the most dangerous source of infection. A careful study of cholera outbreaks shows that very many of them can be easily traced to ani-

mals that have been purchased and brought into the herd while sick or after having been exposed to the disease, or to wandering animals from adjoining farms. Two years ago outbreaks were started in many sections of the state by shipping in stock hogs from Nebraska. Many of these Nebraska hogs had been exposed before shipment, and consequently became conveyors of the disease wherever they were taken. It is true that there are many other ways by which the germ may be carried; for example, by beasts of prey, carion birds, streams of water, feet of attendants in muddy weather, etc., but the living diseased or exposed animal must always be regarded as the most dangerous of all.

Recognizing that the disease has its origin in a specific germ which was probably imported from England, and is kept alive by herds in different sections of the country, and that the disease spreads by being communicated from diseased herds to those unaffected, the question arises as to what part may be played by secondary causes? At the present time some writers contend that while the presence of the germ may be essential in the production of an attack, it cannot alone produce disease; that it must be assisted by other causes. The same ground has been taken regarding cholera in man and tuberculosis in cattle. The writers referred to contend that as the greatest loss prevails in the corn growing belt, the almost exclusive corn diet is the necessary assisting factor in producing the disease, and that if a mixed diet were fed, the disease would be much less prevalent. Others contend that as that the outbreaks usually occur at that season of the year when new corn is being fed that the green corn is actually the cause of the disease; others think that our improved breeds of swine have such a low resisting power that they contract the disease when the bacon breeds would escape. Let us notice these theories briefly.

First—Is the hog cholera germ alone capable of producing disease without the aid of other causes? After a study of many outbreaks affecting different breeds kept under different conditions, I am firmly of the opinion that virulent cholera

virus will produce an outbreak of cholera without the action of secondary causes. It is true that there is some difference in the susceptibility of animals to the plague, and also a difference in the virulency of the germ from different outbreaks. No breed of swine, however, can be considered exempt from cholera. I have seen the celebrated razor-back on his native heath die as rapidly as our most improved breeds in the north. The celebrated bacon breeds also readily contract the disease when exposed, as was shown the past season at the Experiment Station. I am satisfied that the greatest loss occurs in the corn belt, principally because more hogs are kept and the chances of communication are better. The keeping of an animal in vigorous health by observing the proper rules of sanitation and feeding, will render it to a certain extent less liable to any disease, but such care will not grant immunity against our swine epizootics. I have stated that in some instances the germ is more virulent than at other times. This and the difference in susceptibility that animals may possess, probably accounts for the mildness of some outbreaks and the virulency of others. When a herd having great resisting powers is exposed to virus from a mild outbreak, a mild form of cholera will result, and vice versa. There are probably several factors which may influence the severity of an outbreak. The condition of the soil, temperature and amount of moisture present, no doubt play important roles. Again, a mixed outbreak of the two affections may be more severe than an attack of hog cholera or swine plague alone. Bad sanitation I consider renders more assistance in the spreading of cholera than all other secondary causes. This does not act so much, as some suppose, by weakening the animal, as by rendering the development and transportation of the germ easy.

The theory that the disease is caused by feeding new corn has nothing to support it except that the disease is usually prevalent in early fall when new corn is being fed. There is no connection between the two. It happens to be the case that in the fall of the year the climatic conditions are favorable for the development of the hog cholera bacillus. At the

same time in the year the corn crop is maturing and farmers begin to feed it. In the human family typhoid fever most often occurs in the fall of the year, but the physician does not attribute it to any particular diet people may eat at that time. The fact is that hog cholera and typhoid fever are very similar diseases and always rage most extensively in late summer and fall because conditions outside of the body are then most favorable for the development of the virus. New corn may produce indigestion (very seldom does however) but never cholera. We may leave this part of the subject by repeating that our swine epizootics are specific diseases caused by living germs, and that while there are secondary causes that may increase the susceptibility to disease and assist in spreading the contagion, none of them will cause an outbreak without the germ. On the other hand the virus may be sufficiently virulent to cause a fatal outbreak in the most vigorous well cared for herd. The last is also true of other animal diseases, and he who would protect live stock against infectious and contagious diseases by other means than by excluding the virus makes a fatal error.

The most practical question of all is: What shall or can be done to prevent the great loss which occurs yearly. For twenty years the disease has been very prevalent and for more than ten years the cause has been known and sanitary measures recommended calculated to arrest the spread of the trouble, and yet the disease is as prevalent as ever. Practically no progress has been made so far in dealing with it. Must the great loss continue, or will a cure or preventive be discovered? Can the plague be stamped out by the application of the vigorous measures recommended by some, or how can it best be dealt with? These are important questions and ones not easily answered. Much might be written regarding the use of drugs. For years we have frequently heard that this one and that one had a cure for the disease. The past season these "cures" have been more numerous than ever, and yet not one of these compounds has stood the test when applied to the treatment of different outbreaks of the disease.

I have already explained that the disease may be mild or severe and that in some herds a majority recover without treatment. This difference in virulency makes much difference in the apparent results of treatment, so that if a medicine be used in a mild outbreak, recovery may be the rule, while if used in a very virulent outbreak, all may die.

In view of these facts I unhesitatingly say that whatever reputation has been gained by any one of the cholera compounds, has been obtained by its being used when the disease was mild or when the animal would have recovered without any treatment. I have heard breeders state that after trying a preparation two years in succession with apparent good results, it utterly failed the third year.

The preparation tried and recommended by the Bureau of Animal Industry, acts in a similar way to other cholera mixtures. It appears to do good in some herds; in others it is of no merit. When tried on the Agricultural College herd it was of no apparent benefit, either as a preventive or curative agent. It is not reasonable to suppose, in my opinion, that any drug or combination of drugs will prove a specific for hog cholera. There is no specific for typhoid fever and cholera in man, nor other diseases of a like nature. While I have no faith whatever in the successful treatment of virulent hog cholera or swine plague, I do not wish to be understood as discouraging the use of drugs altogether, in the management of these affections, for no doubt recovery can be assisted in mild attacks by proper medication. The practicability of treatment even in these cases may be questioned, for the cost of medicine and time spent in administering, is often in excess of the benefit derived, and unless the herd be so situated that medication can be carried out without great expense and bother, the administration of no drug whatever is advisable. A purgative at the outset of the disease, followed by some antiseptic like carbolic acid or hyposulphite of soda, will give as good results as anything.

Since it is becoming more generally understood that treatment is of little avail, more attention is being paid to

preventive measures. A number of years ago, Dr. Billings, then of the Nebraska Experiment Station, announced with much positiveness, that he could prevent the disease by inoculation. I deem it necessary to refer briefly to this subject, as Dr. Detmers and one or two others during the past season have quite extensively advertised for herds to inoculate, contending that their method was a success. Inoculation for the prevention of hog cholera tried by the Bureau of Animal Industry, at an early day, and practiced later by Billings, Detmers and others, consists of injecting beneath the skin of the animal to be protected a small amount of an artificial culture of hog cholera bacteria. The culture is obtained by inoculating beef broth with blood from a cholera hog. In other words the hog is inoculated with a small amount of hog cholera virus—an amount supposed to be so small and attenuated in virulence that sufficient disturbance will be set up in the body to render the animal immune, but not to cause cholera.

A study of the work along this line shows that very different results follow the inoculation of different herds. A variable per cent of animals inoculated are protected against cholera. Some continue susceptible and contract the disease when exposed, and others contract cholera as the result of the inoculation. The results of inoculation made during the past season are far from satisfactory, and the fact that the disease may be started by this method of inoculation where it did not exist before, renders prevention by this means somewhat hazardous to say the least. Even if this dangerous factor could be eliminated, I do not believe a large enough per cent are protected to render inoculation of much value.

A few years ago the chemist of the Bureau of Animal Industry announced that the blood serum of small animals which had been artificially rendered immune against cholera, could be used to render other animals immune. More recently, Dr. Peters, of the Nebraska Experiment Station, who has recently begun work along this line, announces that by repeatedly inoculating the horse with a virulent hog cholera culture, it can be rendered so immune that its blood serum can be used to

protect swine against cholera. This is another application of the Serum Therapy treatment of disease.

While it has been shown that immunity can in some cases be produced in this way, a sufficient amount of work has not yet been done to determine the degree of success and practicability of the method. In the serum therapy treatment proper there is no danger of starting an outbreak of disease, as no hog cholera bacteria are injected, as is the case when inoculation, according to the method of Billings or Detmers is practiced, and if a sufficient degree of immunity can be produced to protect, the method will have much to recommend it. In a late paper, however, it is announced that this method is more successful when a small amount of cholera virus is used along with the serum, a combining of serum therapy with inoculation. It would seem to the writer that the use of a virulent virus along with the serum, complicates the treatment and renders it open to some of the objections brought against inoculation as practiced by Billings and others. It is also the opinion of the writer that if the loss is to be prevented by the use of a theraputic serum that two serums will be necessary, one for hog cholera and one for swine plague. This also applies to inoculation.

Should the serum therapy treatment prove practicable, it will be of much service in preventing the ravages of the swine diseases, but sanitary rules and regulations must continue to offer the best solution of the trouble. There can be no question but what if a well organized system of sanitary science and police could be put in force, our swine epizootics would soon cease to cause serious loss. While it may not be possible to completely stamp out these diseases on account of the great extent of territory involved, and the length of time that the virus lingers about the premises, the loss can be so much reduced as to be of little moment. Such efficient regulations cannot be put in force by swine raisers, but must come from the general government or state, and in the main would consist of destroying some herds, quarantining others and of a thorough supervision of all swine traffic.

The writer is firmly of the opinion that much more should be done by the swine owners themselves than is being done. One of the very essential things in resisting the ravages of the affections under discussion, is for the people to accept the findings of investigators and try to put into effect the advice given, instead of giving heed to the theories of those who have no knowledge of animal diseases, as many are inclined to do.

As already indicated, the most essential preventive measure is the excluding of all sources of contagion. To accomplish this result, it is very necessary that all swine bought for breeding or feeding purposes, should be quarantined for at least thirty days before being placed with the herd, and that the water supply be carefully looked after. Water from deep wells is always preferable; that from streams and surface wells may become polluted with cholera germs. The herd most completely shut off from the outside world during cholera times, is the one most liable to escape.

After the disease appears, something can be accomplished by separating the herd into small bunches kept some distance apart, by cremating the dead, and by disinfecting the yards and pens by the free use of lime or crude carbolic acid. If the farm is re-stocked with swine, new yards should be provided.

For ten years or more the true cause of cholera has been known and the proper rules and regulations for its suppression recommended; but instead of following the advice given many have given prominence to such supposed causes as the feeding of new corn, breed of swine, worms, and others, which have been much discussed to the exclusion of the real issue. If every swine raiser would remember the main facts, viz: that the disease is communicable, occurring only as the result of the presence of the cholera or swine plague germ; that the sick or exposed hog is the usual carrier of the virus, that the disease is incurable, and would then do the best he can to exercise the necessary precautions to prevent disease reaching his premises, the great annual loss would be very

greatly reduced. Such work on the part of swine owners in co-operation with sanitary police work on the part of the government would soon place us in a position where the epizootic diseases of swine would give us little trouble.